Analysis of ν_μ CC Events

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Outline

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Motivation

Analysis of the muon charged current events is important for several reasons :

1) We use the muon events to determine the neutrino energy spectrum.

2) We must demonstrate that our event selection and reconstruction programs are working properly; the muon events provide a relatively high statistics, simple topology sample of events with which to do this.

3) We can locate potentially interesting events by studying events with muons that don't link to the primary emulsion vertex.

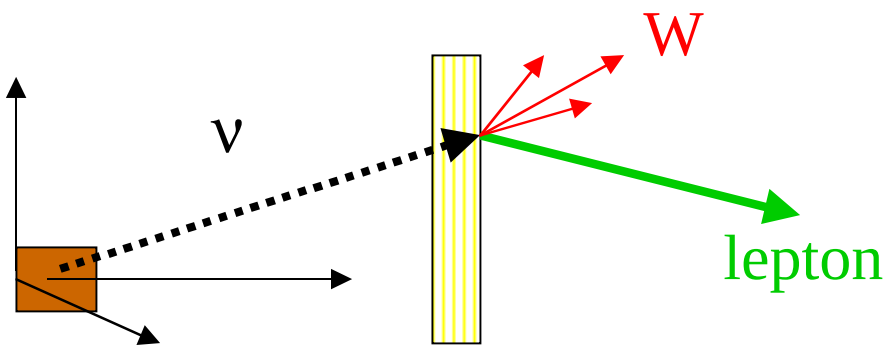
Event Definition

Charged Current neutrino events can be defined by the following **measured** quantities :

neutrino direction : $\vec{p}_\nu$
visible energy : E_{vis}
lepton momentum : $\vec{p}_l$
neutrino type : from sign of $\vec{p}_l$

and from the following **calculated** quantities :

angle between the lepton and the jet : $\Delta\phi$
lepton transverse momentum : $p_{T\ lep}$
y-distribution (from E_{vis}) : $1 - E_{lep}/E_{vis}$



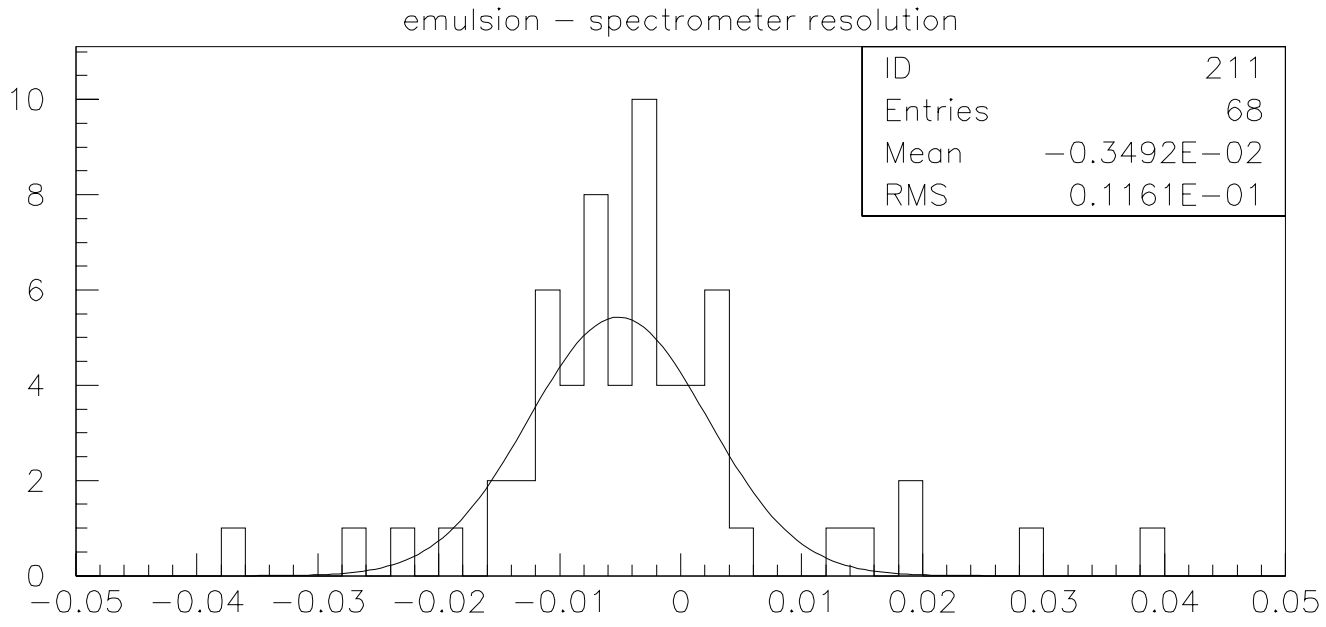
Event Selection

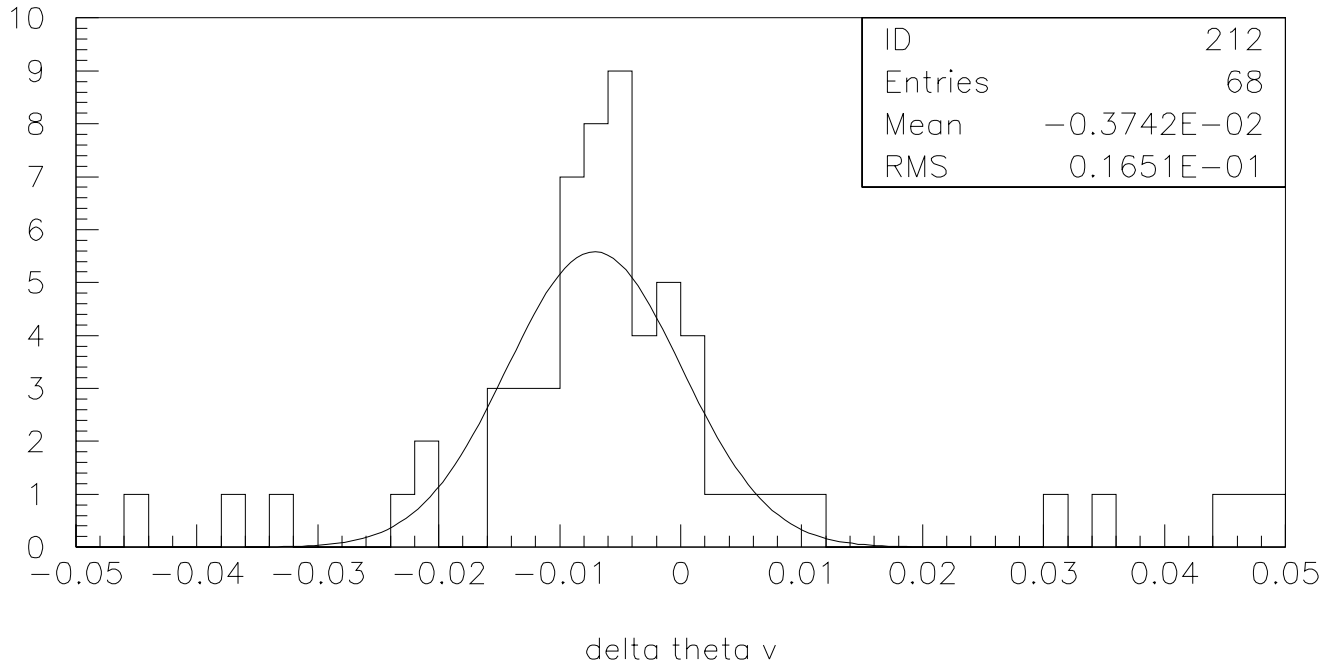
- **Emulsion**
  - Pass 1 Data : Located vertex is GIVEN
  - Pass 2 Data :
    - Unique High Multiplicity Vertex is selected as the primary $\Rightarrow \geq 4$ tracks from primary
    - Select vertex with "best" number of matches to fiber lines
  - For each event I verify visually that the vertex is "correct" by checking the matching of emulsion to spectrometer tracks or lines.
- **Spectrometer**
  - Select events which have at least one final track with $\sum$muid ≥ 4
- **Matching**
  - "match" the muon(s) to the emulsion track which is closest in u *and* v

Measurements

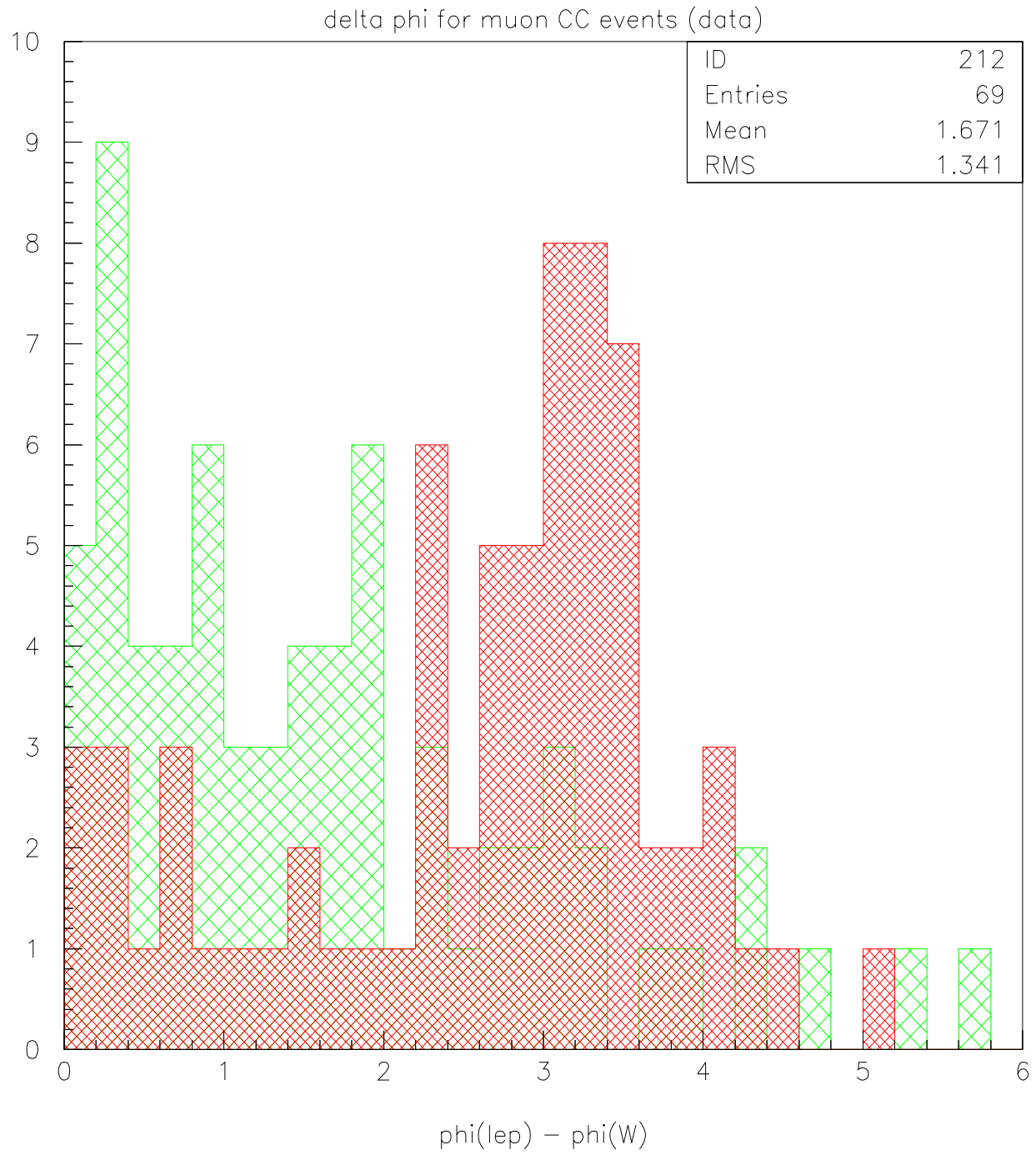
- For each event I will determine the following quantities :
  - $\vec{p}_{\mu}$:magnitude and sign (spectrometer)
  - muon track at the primary vertex (emulsion)
    - Resolution
  - $\Delta\Phi$ in the plan transverse to $\vec{\mathbf{p}}_{\nu}$
  - p_{Tlep}
  - $E_{vis} = E_{lep} + \sum E_{had} + \sum E_{em}$
  - y_{vis}

Results : σ_u σ_v





Results : $\Delta\phi$



Conclusion

Events :
sample will be increased by ~20% with events where the vertex has yet to be visually verified but are likely to be OK (next week);
A few events in the present pample have poor resolution and these need to be studied in more detail and either fixed or eliminated.

Calculations:
$p_{\mathrm{T}lep}$ is easy and will be included;
E_{vis} requires more effort and I will begin this asap.